IV. "The Specific Heat of Mixtures of Alcohol and Water." By A. Dupré, Ph.D., Lecturer on Chemistry at the Westminster Hospital, and F. J. M. Page. Communicated by C. Brooke, M.A. Received March 26, 1868.

(Abstract.)

The authors have examined a number of mixtures of alcohol and water. They show that the specific heat of these mixtures, up to an alcoholic strength of about 36 per cent., is higher than the specific heat of water itself.

Two methods were employed for estimating the specific heat exactly opposite in principle.

The first consisted in heating a metallic weight to a certain temperature in a steam-oven, similar to that employed by Regnault in his researches, and then plunging it into the liquid the specific heat of which is to be estimated. The rise in the temperature of equal quantities of different liquids produced by the introduction of the same weight, heated to the same temperature, is inversely proportional to the specific heat of such liquids.

Two weights and several calorimeters of different sizes were used. One of the weights was made of brass and weighed 246·49 grms., the other was of copper gilt weighing 614·49 grms. Both weights were made in the form of stout rings, and in the inner cylindrical opening of each a small fan-wheel was inserted.

These rings, after being heated and let down into the calorimeter, were attached to a strand of worsted, and held freely suspended in the liquid of the calorimeter. The worsted had previously been twisted, and when now allowed to untwist it causes a rapid rotation of the ring. The fan-wheel fixed inside the ring thereby produces a current, which, passing through the ring, not only serves to mix the liquid thoroughly, but also considerably facilitates the rapid cooling of the weight.

The calorimeters, as usual, consisted of cylindrical vessels made of very thin polished brass, supported on stretched silk cords, and surrounded by a double cylinder of tin-plate to prevent, as far as possible, any gain or loss by radiation.

The temperature of the liquid was taken by a small thermometer, having a bulb 60 millims. long and about 2·5 millims. diameter. Each degree was divided into twenty parts, and by means of a telescope $\frac{1}{200}$ of a degree could be read off.

The authors give experiments which prove that the high specific heats observed are not due to evaporation caused by the introduction of the heated metals into the calorimeter.

The second method used was that generally employed. A certain weight of the liquid, the specific heat of which is to be estimated, enclosed in a suitable vessel, is heated and then plunged, vessel and all, into a

calorimeter containing a known weight of distilled water. The temperature of the calorimeter will rise, owing to the introduction of the heated liquid, and the elevations in temperature produced by different liquids will, in this case, be directly proportional to their specific heats.

The following Tables give the means of the various results obtained.

Four series of experiments were made. In the first series the brass weight was employed; it was heated to a temperature of about 98° C. In the second and third series the copper weight was used, heated to about 98° and 42° C. respectively. The fourth series was conducted in the ordinary manner.

Specific heat of

5 per cent. spirit.....	Series II.	101·5
10 per cent. spirit.....	Series I. 103·55	
	Series II. 103·49	
	Series III. 103·83	
	Series IV. 103·71	
	Mean	103·64
20 per cent. spirit.....	Series I. 104·16	
	Series II. 104·27	
	Series IV. 104·49	
	Mean	104·30
30 per cent. spirit.....	Series II.	102·47
36 per cent. spirit.....	Series II.	99·90
43 per cent. spirit.....	Series II.	97·59
83 per cent. spirit.....	Series II.	65·88

The authors finally draw special attention to the circumstance that the specific heat of these mixtures not only rises in some cases (up to an alcoholic strength of 36 per cent.) above the specific heat of water, but is above the calculated mean specific heat up to an alcoholic strength of about 74–80 per cent.; beyond which it seems slightly below the calculated mean according to the researches of Regnault and Kopp.

The maximum elevation above the calculated mean coincides pretty closely with the point of maximum contraction.